WHAT IS CLAIMED IS:

1.   A system for virtual interactive design and evaluation and manipulation of vehicle mechanisms comprising:

5   a computer system, wherein said computer system includes a memory, a processor, a user input device and a display device;

a computer generated digital model of a vehicle mechanism stored in said memory of said computer system; and

10   a haptic-user interface operatively in communication with said computer system, wherein said haptic interface includes a haptic end effector device for transmitting information between a user and said digital model, wherein the user interactively creates, modifies, and evaluates kinematic

15   and dynamic properties of the vehicle mechanism using said haptic end effector device.

2.   A system as set forth in claim 1 including a virtual reality display mechanism operatively in

20   communication with said computer system and said haptic-user interface so that the user can see said digital model in a virtual environment.

3.   A system as set forth in claim 1 including

25   at least one control handle on said digital model.

4.   A system as set forth in claim 3 wherein said at least one control handle comprises a spherical button.

5.   A method for virtual interactive design and evaluation and manipulation of vehicle mechanisms using a haptic-user interface, said method comprising the steps of:

importing a digital model of a vehicle mechanism for evaluation using a haptic end effector device operatively connected to a haptic-user interface;

determining whether a user is signaling a mode change for the digital model;

determining the mode change if the user is signaling a mode change of the digital model;

getting a position of the haptic end effector device into a coordinate reference frame for the digital model if the user is not signaling a mode change of the digital model;

determining whether a control handle on the digital model is close enough to the haptic end effector device;

executing the mode change if the control handle is close enough;

applying an attraction force to the control handle if the control handle is close enough;

determining whether the user is terminating the session; and

terminating the session if the user is terminating the session.

6.   A method as set forth in claim 5 wherein said step of executing the mode change includes the steps of:

determining a position of the haptic end effector device;

mapping the position of the haptic end effector device;

using the position of the haptic end effector device to move a mechanism trajectory relative to a CAD assembly of the digital model;

updating parameters of the mechanism;

updating graphics of the haptic-user interface; and

determining whether the user is signaling end of the mode.

7.   A method as set forth in claim 5 including the step of getting the position of the haptic end effecter device if the user is not signaling a mode change.

8.   A method as set forth in claim 7 including the step of selecting a digital model of the vehicle mechanism from a database in the memory of the computer system prior to said step of getting the position of the haptic end effecter

device, wherein the digital model is a computer-aided design model.

9.   A method as set forth in claim 7 including the step of updating graphics prior to said step of determining whether the user is terminating the session.

10.   A method as set forth in claim 5 including the step of determining whether the user is signaling intent to activate the control handle prior to said step of executing the mode change.

11.   A method as set forth in claim 10 including the step of determining whether the mode change is one of create, edit, or evaluate if the user is signaling intent to activate the control handle.

12.   A method as set forth in claim 5 including the step of setting the mode equal to evaluate prior to said step of determining whether the user is signaling a mode change.

13.   A method as set forth in claim 12 including the step of determining whether the mode is equal to create if the user is signaling a mode change.

14.   A method as set forth in claim 13 including the step of setting the mode to create if the mode is equal to create.

15.   A method as set forth in claim 13 including the step of determining whether the mode is equal to edit if the mode is not equal to create.

16.   A method as set forth in claim 15 including the step of setting the mode to evaluate if the mode is not equal to edit.

17.   A method as set forth in claim 15 including the step of setting the mode to edit if the mode is equal to edit.

18.   A method for virtual interactive design and evaluation and manipulation of a vehicle mechanism using a haptic-user interface, said method comprising the steps of:

importing a digital model of a vehicle mechanism for evaluation using a haptic end effector device operatively connected to a haptic-user interface;

setting a mode equal to evaluate;

determining whether the user is signaling a mode change for the digital model;

changing the mode if the user is signaling a mode change of the digital model;

getting a position of the haptic end effector device position into a coordinate reference frame for the digital model if the user is not signaling a mode change of the digital model;

mapping the position of the haptic end effector device into CAD space of the digital model;

finding the closest control handle on the digital model;

determining whether the closest control handle on the digital model is close enough to the haptic end effector device;

determining whether the user is signaling intent to activate the control handle if the closest control handle is close enough;

determining the mode change and executing the mode change if the user is signaling intent to activate the control handle;

applying an attraction force to the closest control handle if the closest control handle is close enough;

updating graphics of the digital model;

determining whether the user is terminating the session; and

terminating the session if the user is terminating the session.

19.   A method as set forth in claim 18 wherein said step of executing the mode change includes the steps of:

determining a position of the haptic end effector device;

mapping the position of the haptic end effector device;

using the position of the haptic end effector device to move a vehicle mechanism trajectory relative to a CAD assembly of the digital model;

updating parameters of the vehicle mechanism;

updating graphics of the haptic-user interface; and

determining whether the user is signaling end of the mode.